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NAVY ELECTRONICS LAB SAN DIEGO CALIF

MAGNETIC RUBBER HYDROPHONES. (U)

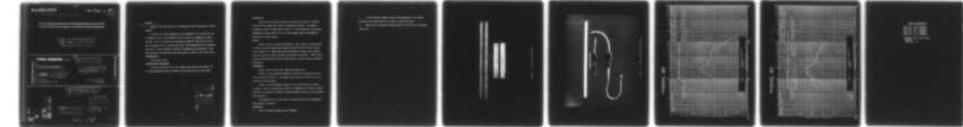
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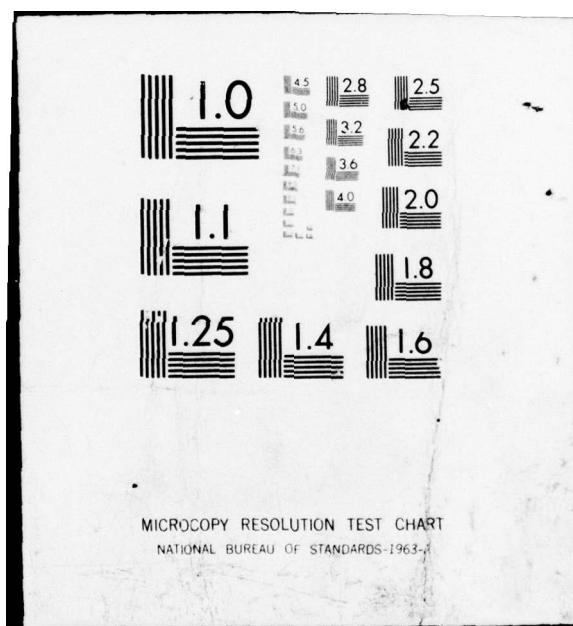
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This is a working paper giving tentative information about some work in progress at NEL.  
If cited in the literature the information is to be identified as tentative and unpublished.

14 NEL-TM-971

TECHNICAL MEMORANDUM

TM-971

NEL/Technical Memorandum 971

6 MAGNETIC RUBBER HYDROPHONES

8 Aug 1966

12 8P  
F. R. Abbott (Code 3130)

9 Technical memo

16 F10103

SF 101 03 16(11351)  
NEL L30761  
LPN

17 SF1010316

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NEL/Technical Memorandum 971

PROBLEM

↓ The objective of this study was to

Appraise the practicability of hydrophones formed from magnetic rubber.

RESULTS

A series of 23 such hydrophones were assembled, their sensitivity was a tolerable -100 to -120 dbv/dyne in view of their low impedance of about 20 ohms. A 15 to 1 turns ratio transformer raised the sensitivity to the more acceptable -80 to -100 dbv/dyne range. The hydrophones were intolerably sensitive to static pressure variations accompanying sea operations. They could perhaps find application as towed arrays in lakes or very quiet seas.

RECOMMENDATION

Discontinue effort.

ADMINISTRATIVE INFORMATION

Work was done under SF 101 03 16 Task 11351, NEL Problem L30761, by the Electrodynamics Division of NEL, Code 3130 during Fiscal Year 1966.

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## INTRODUCTION

Flexible strip magnetic material as marketed is usually of powdered Barium Ferrite loaded latex rubber or polyvinyl chloride. Its magnetic remanence is about a tenth that of Alnico V. It was hoped that serviceable hydrophones could be made of it to be less fragile than the contemporary piezoelectric ceramic types.

## DESIGN

Figure 1 shows two opened hydrophones. These consist of mating pairs of rubber strip with magnetically opposing bobbins wound with #30 Formvar coated copper wire. Additional rubber rods along the edges, when cemented together provide for about 0.020" air gap between the bobbins. Their mutual repulsion precludes pole locking, characteristic of many variable reluctance transducers.

## PERFORMANCE

Figure 2 shows three of the completed sealed units.

Figure 3 is the frequency response of Serial # 16 which was similar to the top unit of figure 1. The output level from 100 to 1000 cps is considered very satisfactory.

Figure 4 is the frequency response of Serial # 6 which was similar in design. Note the sensitivity to depth that appeared even though a bladder reservoir was attached to maintain internal pressure equal to the surrounding water pressure.

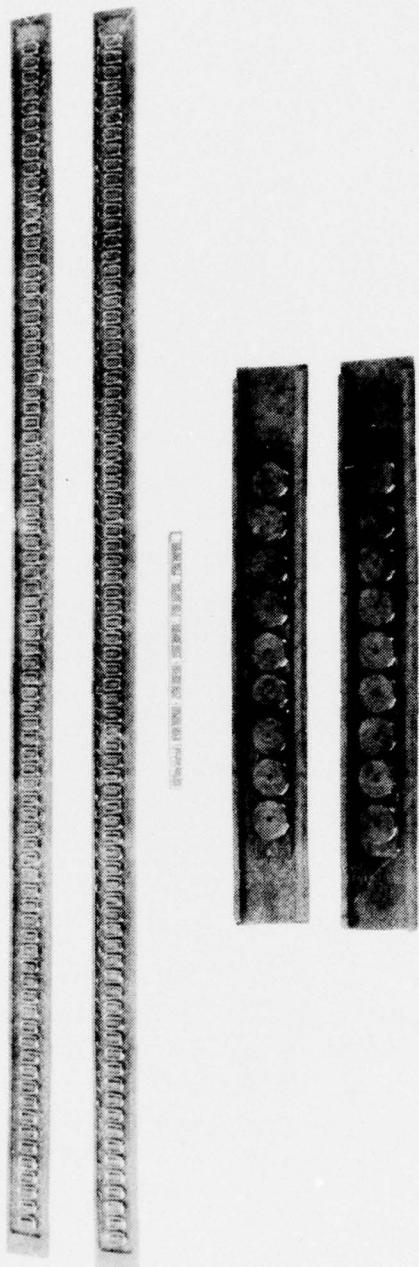
The response level is the series voltage from sets of wound magnetic bobbins shown by figure 1.

## CONCLUSIONS

1. The low frequency sensitivity is adequate.

2. A broad resonant response results from compliance of the rubber strips and gas, associated with the mass of rubber and water.
3. Sensitivity to pressure obviates utility of the device to sea operational use.

Figure 1 — Two open hydrophones.



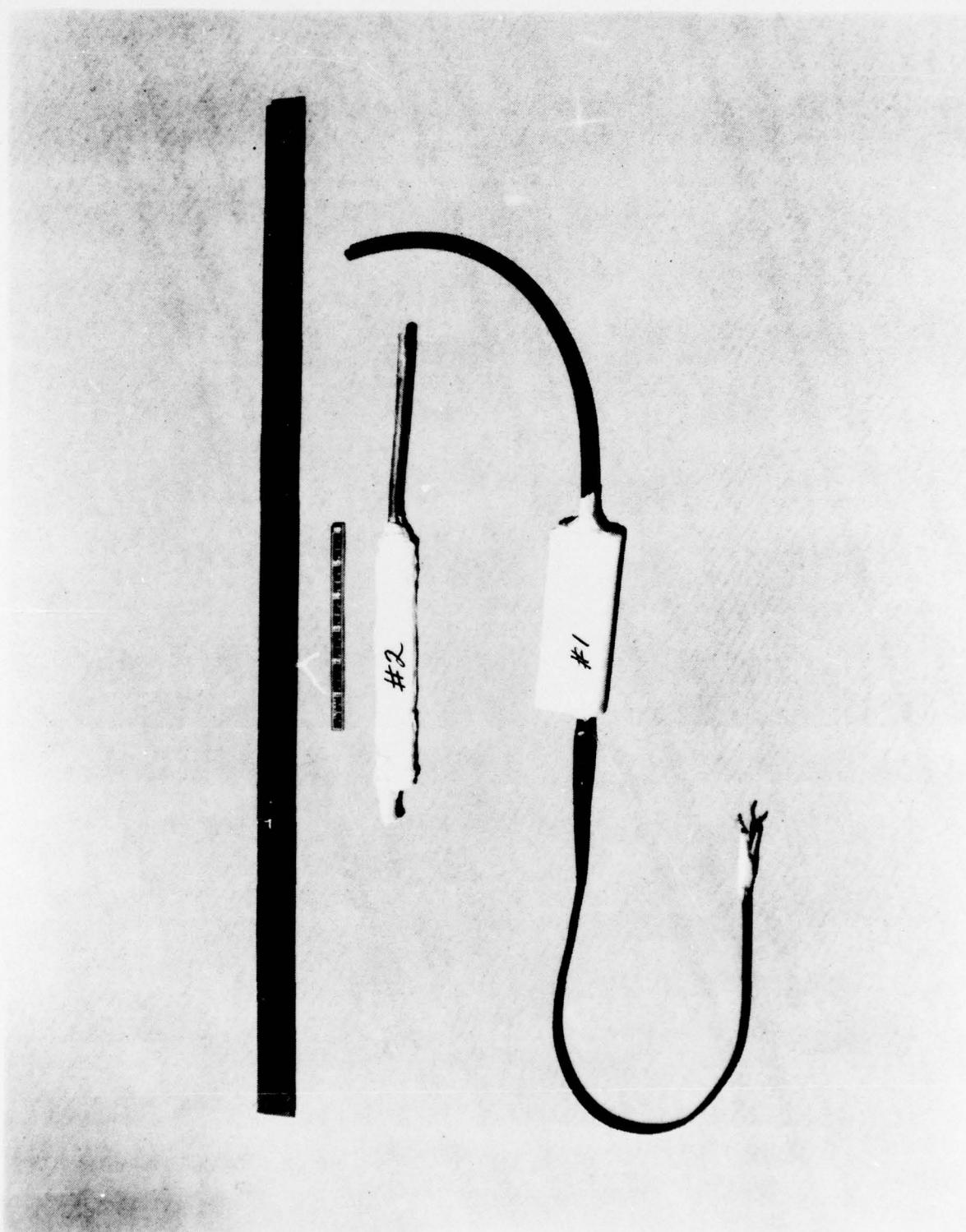


Figure 2 -- Three completed sealed units.

**K·E** SEMI-LOGARITHMIC  
KUFFEL & KRIBER CO.  
MADE IN U.S.A.  
3 CYCLES X 70 DIVISIONS

3597-71  
ALBANENE

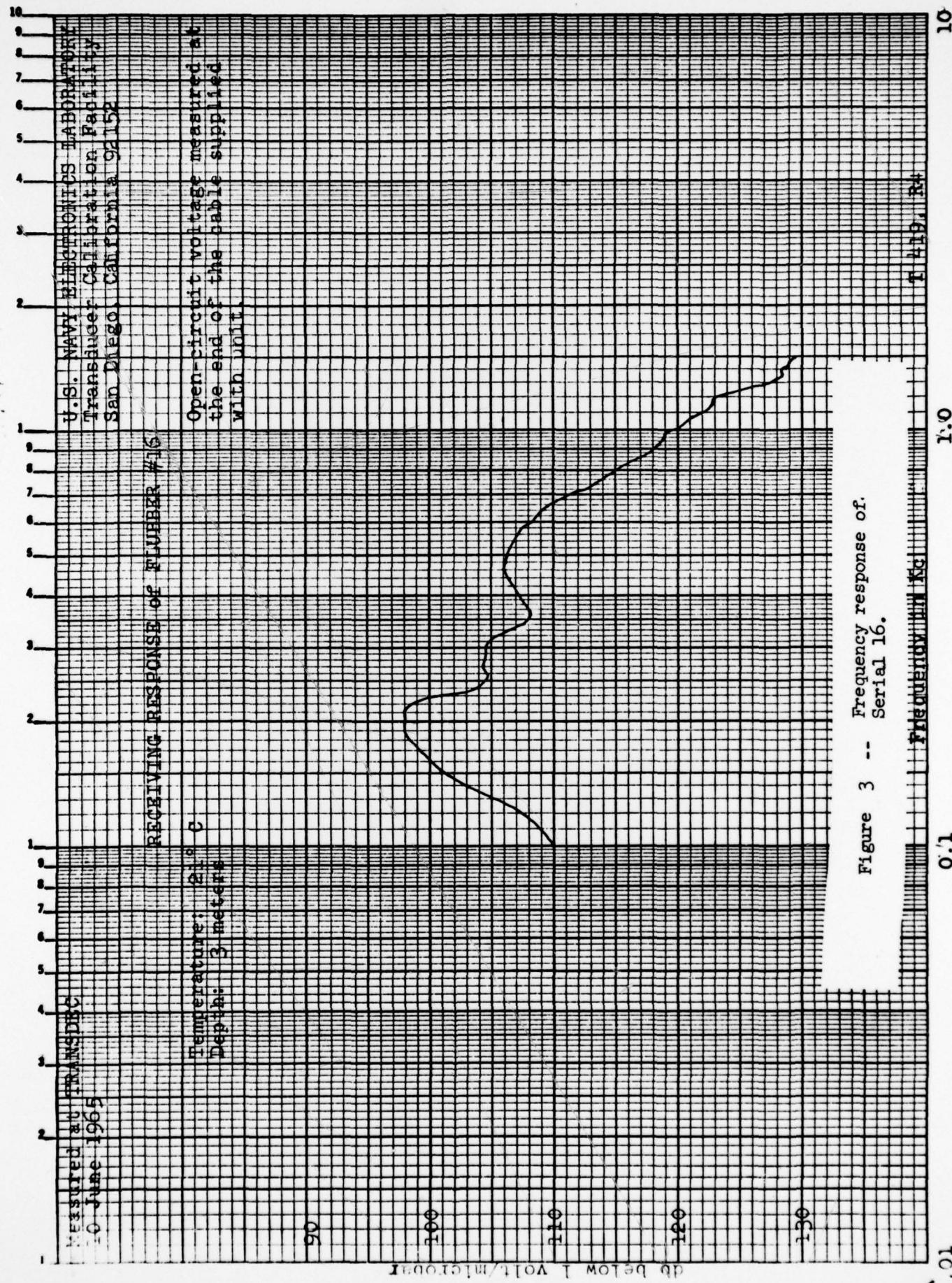


Figure 3 -- Frequency response of  
Serial 16.

**K+E** SEMI-LOGARITHMIC  
KEUFFEL & ESSER CO.  
3 CYCLES X 70 DIVISIONS

359T-71  
MADE IN U.S.A.  
ALBANYONE ①

Measured at 27° C. 1965

U.S. TAPE ELECTRONICS LABORATORY

Transducer Calibrated on Facility  
San Diego California 02142

RECEIVING RESPONSE OF FIBREGLASS No. 6 WIRE TRANSFORMER

Temperature	11.5 °C
Depth:	2.0 meters
	1.0 meters
	0.0 meters

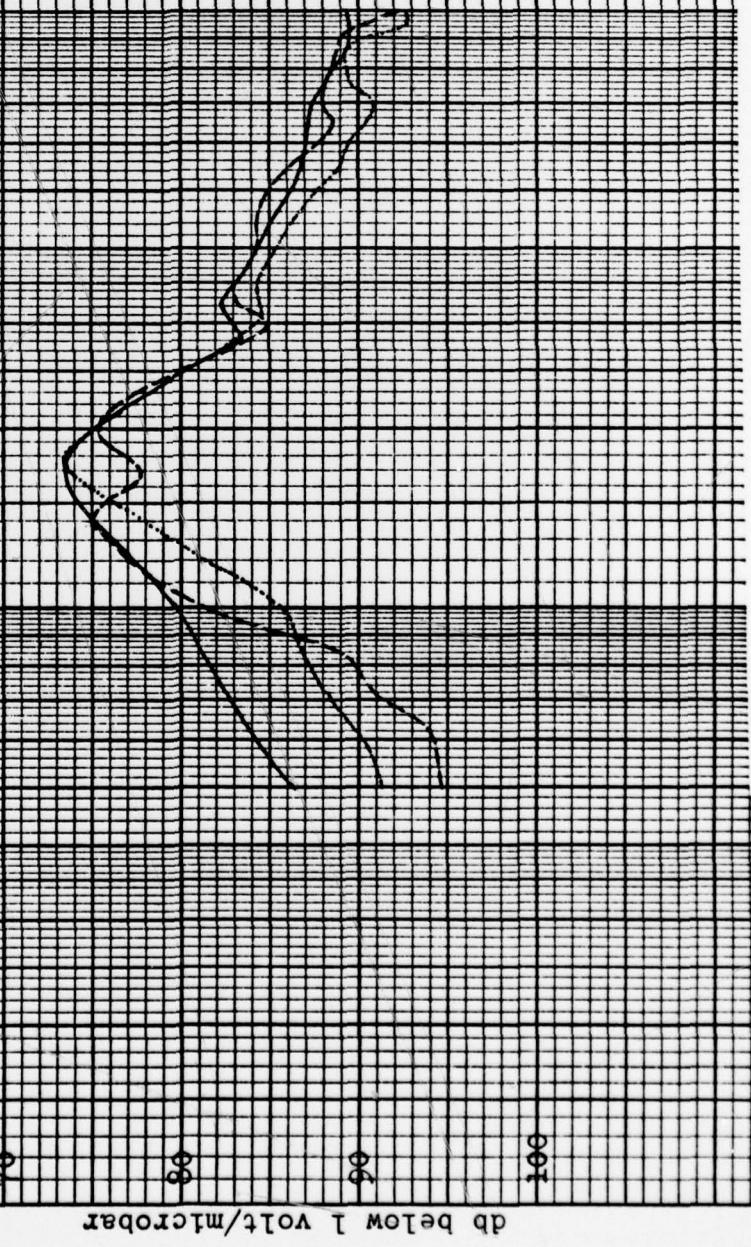


Figure 4 -- Frequency response of Serial 6.

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